FEBRUARY 2016 – Z-LAYER SEDIMENT SAMPLING PROGRESS SUBMITTAL

JORGENSEN FORGE EARLY ACTION AREA REMOVAL ACTION

CONSTRUCTION QUALITY ASSURANCE PLAN—MODIFICATION NO. 1

Prepared for

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LIST OF ACRONYMS AND ABBREVIATIONS

ARI	Analytical Resources, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQAP Modification No. 1	Construction Quality Assurance Plan Modification No. 1
EAA	Early Action Area
EMJ	Earle M. Jorgensen Company
EPA	U.S. Environmental Protection Agency
September 8, 2015 EPA Modification Letter	Letter Regarding EPA Modifications to Addendum No. 2, Operations, Monitoring, and Maintenance Plan, Jorgensen Forge Early Action Area Removal Action, and Construction Quality Assurance Plan Modification No. 1, Jorgensen Forge Early Action Area Removal Action
FSP	Field Sampling Plan
LDC	Laboratory Data Consultants
PCB	polychlorinated biphenyl
PPE	personal protective equipment
PS SRM	Puget Sound Sediment Reference Material
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RAB	Removal Action Boundary
RPD	relative percent difference
RvAL	Removal Action Limit
Settlement Agreement	Administrative Settlement Agreement and Order on Consent for Removal Action Implementation
TSDF	Treatment, Storage, and Disposal Facility

1 INTRODUCTION

Anchor QEA, LLC (Anchor QEA) and Farallon Consulting, LLC (Farallon) prepared this data submittal on behalf of the Earle M. Jorgensen Company (EMJ) to present the post-construction Z-layer sediment sampling results collected at the Jorgensen Forge Early Action Area (EAA) in February 2016. The sediment sampling was conducted in accordance with the U.S. Environmental Protection Agency (EPA)-approved Construction Quality Assurance Plan Modification No. 1 (CQAP Modification No. 1; Anchor QEA 2015); Letter Regarding EPA Modifications to Addendum No. 2, Operations, Monitoring, and Maintenance Plan, Jorgensen Forge Early Action Area Removal Action, and Construction Quality Assurance Plan Modification No. 1, Jorgensen Forge Early Action Area Removal Action, dated September 8, 2015 prepared by EPA (September 8, 2015 EPA Modification Letter; EPA 2015); and *Basis of Design Report, Appendix D: Construction Quality Assurance Plan* (Anchor QEA 2013).

This progress submittal includes the following information:

- Summary of all field activities (Section 2)
- Final quality assurance(QA)/quality control (QC) report to ensure that data quality is sufficient to meet project objectives and support project decisions (Section 3.1 and Appendix A)
- Tables of sample collection and analytical results (Tables 1 to 4)
- Figures of sample collection locations, total polychlorinated biphenyl (PCB) Removal Action Limit (RvAL) exceedances, and grain size results (Figures 1 to 3)
- Electronic (PDF) copies of all relevant field and analytical data forms and reports, including QA/QC data (Appendices A, B, C, D, E)

2 SUMMARY OF FIELD ACTIVITIES

Post construction Z-layer sediment sampling field activities within the Removal Action Boundary (RAB) occurred between February 9 and February 12, 2016. Farallon and Anchor QEA managed and performed the sampling on behalf of EMJ in coordination with the following EPA-approved subcontractors:

- Cascade Drilling, L.P. provided the sonic drilling sampling equipment
- Northern Marine Construction provided the support barge
- Marine Sampling Services provided vessel support for sediment processing
- Analytical Resources, Inc. (ARI) performed the chemical analysis
- Materials, Testing, and Consulting, Inc. performed the geotechnical analysis
- Laboratory Data Consultants (LDC) performed the data validation
- Stericycle provided waste disposal services

2.1 Z-layer Sediment Sampling

Z-layer sediment samples were collected, processed, and analyzed as described below.

Sediment samples were collected using sonic drilling methods at stations co-located with the seven Z-layer sample stations collected in July and August 2014 during the removal action within the RAB (Figure 1). Samples were collected at the 0- to 1-foot, 1- to 2-foot, and 2- to 3-foot intervals below the post-dredge surface, defined as the point of contact between the placed shoreline containment filter material or in-water backfill material and underlying material, as described in Section 2.3 of CQAP Modification No. 1. The 0- to 1-foot and 1- to 2-foot intervals were analyzed and the 2- to 3-foot intervals were archived for potential analysis.

The initial analytical results for total (PCBs exceeded the RvALs in the 0- to 1-foot interval at PDS-1 and PDS-7, and in the 0- to 1-foot and 1- to 2-foot intervals at PDS-5. The 2- to 3-foot archived samples were triggered for analysis of total PCBs, grain size, total organic carbon, and total solids at PDS-1, PDS-5, and PDS-7, per Section 4.1 of CQAP Modification No. 1.

Table 1 provides a summary of sample station coordinates, sample identification, recovery measurements, and testing parameters.

2.1.1 Reporting

The analytical results for the Z-layer samples are presented in Table 2 and Figures 2 and 3. Digital LogPlot sonic drilling sediment processing logs are provided in Appendix B. All field documentation, including sonic drilling sediment collection and processing logs, daily logs, health and safety logs, and chain-of-custody forms are provided in Appendix C. Sonic drilling sediment sample photographs are provided in Appendix D.

2.2 Investigation-Derived Waste Material

Investigation-derived waste material was collected, stored, and managed as detailed in Section 5 of the Field Sampling Plan (FSP; Anchor QEA 2015). The chemical analytical data for the different waste streams generated during the sampling event (i.e., water and sediment) were provided to the disposal company (Stericycle). Based on the required sampling and analysis and review of the chemical analytical data, the sediment and decontamination water were considered non-hazardous waste (non-regulated) material (Table 3). Three sediment drums, three decontamination water drums, and one personal protective equipment (PPE) drum were transported and disposed at Waste Management's Columbia Ridge Subtitle D Landfill in Arlington, Oregon. The decontamination waste water was solidified at the Stericycle Environmental Solutions Treatment, Storage, and Disposal Facility (TSDF) in Kent, Washington, and then transported and disposed at the Columbia Ridge Subtitle D Landfill.

Per Section 21.b. of the Settlement Agreement, EMJ received certification from EPA on March 29, 2016 (Appendix F) that the following facilities are operating in compliance with the requirements of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121(d)(3), 42 United States Code Section 9621 (d)(3), and 40 Code of Federal Regulations Section 300.440:

- Stericycle Environmental Solutions Kent – TSDF in Kent, Washington: primary receiving for all waste materials

- Columbia Ridge Landfill in Arlington, Oregon: for non-regulated and Resource Conservation and Recovery Act-regulated solids, debris, and solidified liquid materials (sediment, rinse water, PPE)

3 QA/QC REPORT

This section provides a QA/QC report to ensure that data quality is sufficient to meet the project objectives identified in the CQAP Modification No. 1. This section includes a data quality assessment with field and laboratory components, Puget Sound Sediment Reference Material (PS SRM) results, data validation findings, and a completeness assessment.

The post-construction Z-layer sediment sampling and analysis was conducted in accordance with the CQAP Modification No. 1, the September 8, 2015 EPA Modification Letter, the Settlement Agreement, and the Statement of Work (including data validation, chain-of-custody procedures, analyses, and other procedures included in each document).

3.1 Data Quality Assessment

As summarized below, the data quality assessment indicated that the data quality is sufficient to meet project objectives and support project decisions.

3.1.1 Field Data Quality

All samples were stored in iced coolers immediately after collection. Coolers were hand delivered to the laboratory at the end of each field day by Anchor QEA field staff. Cooler temperatures were taken upon laboratory receipt and all coolers had temperatures within QAPP criteria.

Field data quality was assessed by the collection of a field equipment blank and two field duplicates (1 per 20 field samples). Field data quality samples indicate that field procedures were accurate (no biases present) and precise (consistent) and do not negatively impact field sample data quality. Specifically, the assessment showed the following:

- There were trace PCBs and metals (arsenic, lead, and zinc) in the field equipment blank (rinsate blank). The concentrations detected were below the RvALs in the associated sediment samples (Table 4).
- The field duplicates were evaluated by calculating the relative percent difference (RPD) of the parent and duplicate concentrations. RPD values indicated precise measurement in both field duplicates (59 out of 60 field duplicate results had RPD

values below 50 percent). One field duplicate result had an RPD value that was above 50 percent in one of the two field duplicates. Sample JF-PDS-5-0-1ft-160211 had Aroclor 1248 detected but the sample duplicate did not have this compound detected. These samples (parent and duplicate pair) were highly diluted and the total PCB calculations are very similar. Therefore, no qualifications were made based on this outlier.

A summary of field equipment blank concentrations and field duplicate RPD values are provided in the data validation reports (Appendix A).

3.1.2 Analytical Data Quality

Data quality objectives and QA procedures are provided in the QAPP. Overall analytical data quality, including laboratory control samples, sample replicates, matrix spike samples, and method blanks, indicates that the laboratory procedures and systems were in control. Reporting limits were deemed acceptable to meet project objectives.

The data package was validated by LDC in Carlsbad, California. Data validation reports are provided in Appendix A and laboratory data reports are provided in Appendix E. All data qualifiers applied to the data during final validation have been incorporated into the database for this project. All data were considered useable as reported or as qualified. For duplicate results (both original and dilution results reported), the most technically accurate of the two results was used (see below). Data qualifiers assigned during data validation include the following:

- "J" indicates the associated numerical value is an estimated concentration.
- "U" indicates a reporting limit below which the analyte was not detected.
- "UJ" indicates an approximate reporting limit below which the analyte was not detected.
- "R" indicates that data were rejected due to having duplicate data. In instances where there was more than one data point for an analyte due to dilutions, the more technically accurate result was retained.

The validation process resulted in one J-qualified data result (estimated value) based on a technical advisory, as stated in the data validation report. Aroclor 1254 was qualified in one sample due to an associated continuing calibration verification sample recovering slightly below the control limit. Detailed descriptions of QC outliers are provided in the data validation report (Appendix A).

3.1.3 Puget Sound Reference Material Results

The PS SRM was analyzed by ARI for PCBs. The PS SRM is used to evaluate measurement accuracy and laboratory performance for PCB analyses of sediment collected in Puget Sound. Laboratory results for PCB Aroclor 1260 were within the regional acceptance limits (USACE 2015).

3.1.4 Completeness

Data completeness for the post-construction sediment monitoring at the Jorgensen Forge EAA was assessed based on the collection of required samples in the field and laboratory analysis for all of the target chemicals outlined in the project QAPP. All target samples were collected and submitted for the full suite of required physical and chemical testing.

Laboratory data completeness was measured by the percentage of results reported by the analytical laboratory. Data completeness levels were set at 95 percent for all parameters, according to data quality objectives specified in the QAPP. Completeness was measured at 100 percent.

4 REFERENCES

Anchor QEA, 2013. *Basis of Design Report, Appendix D: Construction Quality Assurance Plan (CQAP), Jorgensen Forge Early Action Area.* Prepared for Earle M. Jorgensen Company and Jorgensen Forge Corporation. August.

Anchor QEA, 2015. *Construction Quality Assurance Plan Modification No. 1—Jorgensen Forge Early Action Area*. Prepared for the U.S. Environmental Protection Agency. Seattle, Washington. July.

EPA (US Environmental Protection Agency), 2015. Letter to Mr. E. Gilbert Leon, Jr., Earle M. Jorgensen Company, and Ms. Amy Essig Desai, Farallon Consulting, LLC. Regarding: EPA Required Modifications to Appendix D, Construction Quality Assurance Plan, and Appendix F, Operations, Monitoring and Maintenance Plan, of Basis of Design Report for Jorgensen Forge Early Action Area. EPA Modification Letter. September 8.

USACE (U.S. Army Corps of Engineers), 2015. Puget Sound Sediment Reference Material: Requesting, Analyzing, Validating and Reporting Data. August 6.

TABLES

Table 1
Z-layer Sediment Sampling Collection Data

Station ID	Sample Collection Date	Location (NAD83 WASPN)[a]		Penetration Depth (feet)	Recovery Measurement (feet)	Recovery (%)	Sample Intervals (feet)[b]	Sample ID	Chemical Analytical Parameters
		X Coordinate	Y Coordinate						
PDS-1	2/10/2016	1275828.42	195624.55	15.0	11.5	77	0 to 1	JF-PDS-1-0-1ft-160210	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							1 to 2	JF-PDS-1-1-2ft-160210	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							2 to 3	JF-PDS-1-2-3ft-160210	PCBs, Grain Size, Total Solids, Total Organic Carbon
PDS-2	2/10/2016	1275851.77	195511.49	15.0	11.3	75	0 to 1	JF-PDS-2-0-1ft-160210	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							1 to 2	JF-PDS-2-1-2ft-160210	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							2 to 3	JF-PDS-2-2-3ft-160210	Archive
PDS-3	2/11/2016	1275896.53	195464.87	15.0	8.6	57	0 to 1	JF-PDS-3-0-1ft-160211	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							1 to 2	JF-PDS-3-1-2ft-160211	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							1 to 2 FD	JF-PDS-103-1-2ft-160211	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							2 to 3	JF-PDS-3-2-3ft-160211	Archive
PDS-4	2/10/2016	1275864.72	195311.36	10.0	11.0	110	0 to 1	JF-PDS-4-0-1ft-160210	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							1 to 2	JF-PDS-4-1-2ft-160210	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							2 to 3	JF-PDS-4-2-3ft-160210	Archive
PDS-5	2/11/2016	1275939.65	195364.06	15.0	15.2	101	0 to 1	JF-PDS-5-0-1ft-160211	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							0 to 1 FD	JF-PDS-105-0-1ft-160211	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							1 to 2	JF-PDS-5-1-2ft-160211	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							2 to 3	JF-PDS-5-2-3ft-160211	PCBs, Grain Size, Total Solids, Total Organic Carbon
PDS-6	2/9/2016	1275927.38	195180.23	15.0	10.5	70	0 to 1	JF-PDS-6-0-1ft-160209	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							1 to 2	JF-PDS-6-1-2ft-160209	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							2 to 3	JF-PDS-6-2-3ft-160209	Archive
PDS-7	2/12/2016	1275766.59	195786.90	25.0	21.8	87	0 to 1	JF-PDS-7-0-1ft-160212	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							1 to 2	JF-PDS-7-1-2ft-160212	PCBs, Metals, Grain Size, Total Solids, Total Organic Carbon
							2 to 3	JF-PDS-7-2-3ft-160212	PCBs, Grain Size, Total Solids, Total Organic Carbon

Notes:
FD = field duplicate
NAD83 = North American Datum of 1983
PCB = polychlorinated biphenyl
WASPN = Washington State Plane North
a. Coordinates are in NAD83, WASPN, U.S. Feet.
b. Samples were collected at 0- to 1-foot, 1- to 2-foot, and 2- to 3-foot intervals below the post-dredge surface defined as the point of contact between the placed shoreline containment filter material or in-water backfill material and underlying material as described in Section 2.3 of Construction Quality Assurance Plan Modification No. 1.

Table 2
Z-layer Sediment Sample Results

			Sample ID	JF-PDS-1-0-1ft-160210	JF-PDS-1-1-2ft-160210	JF-PDS-1-2-3ft-160210	JF-PDS-2-0-1ft-160210	JF-PDS-2-1-2ft-160210	JF-PDS-3-0-1ft-160211	JF-PDS-3-1-2ft-160211	JF-PDS-103-1-2ft-160211
			Sample Date	2/10/2016	2/10/2016	2/10/2016	2/10/2016	2/10/2016	2/11/2016	2/11/2016	2/11/2016
			Depth	0 to 1 foot	1 to 2 feet	2 to 3 feet	0 to 1 foot	1 to 2 feet	0 to 1 foot	1 to 2 feet	1 to 2 feet
			Sample Type	N	N	N	N	N	N	N	FD
Parameter	**Analytical Method**	**RvAL**									
Conventional Parameters (%)											
Total organic carbon	Plumb 1981			**0.066**	**0.054**	**0.062**	**0.203**	**0.056**	**0.098**	**0.118**	**0.168**
Total solids	SM2540G			**80.92**	**84.41**	**83.1**	**82.7**	**84.12**	**82.4**	**80.66**	**80.15**
Grain Size (%)											
Gravel	PSEP			**0.6**	**0.2**	**6.2**	0.1 U	0.1 U	**3.6**	**0.3**	**0.8**
Sand, very coarse	PSEP			**1.2**	**1.3**	**5.5**	**0.2**	**0.2**	**4.4**	**1.9**	**1.7**
Sand, coarse	PSEP			**13.1**	**16.2**	**17.2**	**5**	**6.2**	**26.5**	**17.9**	**18.2**
Sand, medium	PSEP			**44.7**	**56.9**	**23**	**34.4**	**48.3**	**39.3**	**36.9**	**37.5**
Sand, fine	PSEP			**24.5**	**19.3**	**43.2**	**43.1**	**34.5**	**17.8**	**22.8**	**22.3**
Sand, very fine	PSEP			**8.5**	**3.5**	**2.6**	**12.1**	**7.5**	**4.8**	**11**	**10.4**
Silt, coarse	PSEP			**2.3**	2.5 U	2.2 U	**1.9**	3.2 U	3.5 U	**4.2**	**4.3**
Silt, medium	PSEP			**1.3**	2.5 U	2.2 U	**0.7**	3.2 U	3.5 U	**1.7**	**1.5**
Silt, fine	PSEP			**1**	2.5 U	2.2 U	**0.4**	3.2 U	3.5 U	**0.9**	**0.9**
Silt, very fine	PSEP			**0.8**	2.5 U	2.2 U	**0.4**	3.2 U	3.5 U	**0.7**	**0.6**
Clay, coarse	PSEP			**0.6**	2.5 U	2.2 U	**0.3**	3.2 U	3.5 U	**0.4**	**0.3**
Clay, medium	PSEP			**0.5**	2.5 U	2.2 U	**0.2**	3.2 U	3.5 U	**0.3**	**0.3**
Clay, fine	PSEP			**1**	2.5 U	2.2 U	**1.1**	3.2 U	3.5 U	**1.1**	**1.1**
Total gravel	PSEP			**0.6**	**0.2**	**6.2**	0.1 U	0.1 U	**3.6**	**0.3**	**0.8**
Total sand	PSEP			**92**	**97.2**	**91.5**	**94.8**	**96.7**	**92.8**	**90.5**	**90.1**
Total silt	PSEP			**5.4**	2.5 U	2.2 U	**3.4**	3.2 U	3.5 U	**7.5**	**7.3**
Total clay	PSEP			**2.1**	2.5 U	2.2 U	**1.6**	3.2 U	3.5 U	**1.8**	**1.7**
Total fines (silt + clay)	PSEP			**7.5**	2.5 U	2.2 U	**5**	3.2 U	3.5 U	**9.3**	**9**
Metals (mg/kg)											
Arsenic	SW6020A	51		**2.4**	**1.3**	--	**1.9**	**1.8**	**2.1**	**2.6**	**2.5**
Cadmium	SW6020A	5.1		**0.08**	**0.0232 J**	--	**0.0421 J**	**0.0297 J**	**0.0478 J**	**0.0489 J**	**0.0361 J**
Chromium	SW6020A	260		**12.6**	**8.2**	--	**8.9**	**8.9**	**10.3**	**11.5**	**9**
Copper	SW6020A	390		**13.5**	**8.5**	--	**8.6**	**8**	**10.2**	**11.2**	**9.9**
Lead	SW6020A	450		**11.4**	**2.3**	--	**2.19**	**2.06**	**3.91**	**2.26**	**1.86**
Mercury	SW7471A	0.41		**0.043**	**0.0058 J**	--	**0.01**	**0.01**	**0.0069 J**	**0.01**	**0.01**
Silver	SW6020A	6.1		**0.073 J**	**0.029 J**	--	**0.036 J**	**0.024 J**	**0.048 J**	**0.043 J**	**0.036 J**
Zinc	SW6020A	410		**83**	**24**	--	**21**	**21**	**24**	**25**	**24**
PCB Aroclors (µg/kg)											
Aroclor 1016	SW8082A			3.8 U	3.9 U	3.9 U	3.8 U	4 U	3.8 U	4 U	3.9 U
Aroclor 1221	SW8082A			3.8 U	3.9 U	3.9 U	3.8 U	4 U	3.8 U	4 U	3.9 U
Aroclor 1232	SW8082A			3.8 U	3.9 U	3.9 U	3.8 U	4 U	3.8 U	4 U	3.9 U
Aroclor 1242	SW8082A			3.8 U	3.9 U	3.9 U	3.8 U	4 U	3.8 U	4 U	3.9 U
Aroclor 1248	SW8082A			58 U	4.9 U	3.9 U	9.4 U	7.9 U	9.5 U	40 U	9.8 U
Aroclor 1254	SW8082A			**110**	**8**	3.9 U	**7.7**	4 U	**17**	4 U	3.9 U
Aroclor 1260	SW8082A			**89**	**5.9**	3.9 U	**6.7 J**	**2.8 J**	**5.6**	**2.5 J**	**2.9 J**
Total PCB Aroclors (U = 0)	SW8082A	130		**199**	**13.9**	3.9 U	**14.4 J**	**2.8 J**	**22.6**	**2.5 J**	**2.9 J**
PCB Aroclors (mg/kg-OC)[a]											
Total PCB Aroclors (U = 0)	SW8082A	12		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Table 2
Z-layer Sediment Sample Results

			Sample ID	JF-PDS-4-0-1ft-160210	JF-PDS-4-1-2ft-160210	JF-PDS-5-0-1ft-160211	JF-PDS-105-0-1ft-160211	JF-PDS-5-1-2ft-160211	JF-PDS-5-2-3ft-160211	JF-PDS-6-0-1ft-160209	JF-PDS-6-1-2ft-160209
			Sample Date	2/10/2016	2/10/2016	2/11/2016	2/11/2016	2/11/2016	2/11/2016	2/9/2016	2/9/2016
			Depth	0 to 1 foot	1 to 2 feet	0 to 1 foot	0 to 1 foot	1 to 2 feet	2 to 3 feet	0 to 1 foot	1 to 2 feet
			Sample Type	N	N	N	FD	N	N	N	N
Parameter	**Analytical Method**	**RvAL**									
Conventional Parameters (%)											
Total organic carbon	Plumb 1981		**1.2**	**0.265**	**0.818**	**0.696**	**0.103**	**0.051**	**0.092**	**0.083**
Total solids	SM2540G		**75.54**	**80.63**	**74.29**	**74.35**	**79.61**	**79.61**	**87.94**	**85.68**
Grain Size (%)											
Gravel	PSEP		**1.4**	**0.6**	**1.6**	**5.3**	**0.1**	0.1 U	**9.5**	**2.3**
Sand, very coarse	PSEP		**1**	**2.2**	**1.8**	**2**	**1.3**	**0.5**	**16.1**	**8.9**
Sand, coarse	PSEP		**4.7**	**13.2**	**14.9**	**14.3**	**25.3**	**12.9**	**42**	**47.6**
Sand, medium	PSEP		**28.1**	**28.5**	**41**	**39.4**	**59.2**	**71.6**	**24**	**31.6**
Sand, fine	PSEP		**32.5**	**31.3**	**15.4**	**15**	**12.1**	**12.7**	**3.6**	**4.9**
Sand, very fine	PSEP		**16.1**	**13.3**	**6.2**	**6.1**	**1.1**	**0.7**	**0.3**	**1**
Silt, coarse	PSEP		**6.6**	**4.4**	**3.9**	**3.3**	1 U	1.5 U	**1.2**	3.7 U
Silt, medium	PSEP		**3.2**	**1.9**	**4.8**	**4.6**	1 U	1.5 U	**0.7**	3.7 U
Silt, fine	PSEP		**2.6**	**1.2**	**5.7**	**4.8**	1 U	1.5 U	**0.6**	3.7 U
Silt, very fine	PSEP		**1.1**	**0.9**	**1.7**	**2.1**	1 U	1.5 U	**0.6**	3.7 U
Clay, coarse	PSEP		**0.6**	**0.6**	**0.8**	**0.9**	1 U	1.5 U	**0.4**	3.7 U
Clay, medium	PSEP		**0.6**	**0.5**	**0.6**	**0.6**	1 U	1.5 U	**0.3**	3.7 U
Clay, fine	PSEP		**1.6**	**1.4**	**1.4**	**1.5**	1 U	1.5 U	**0.9**	3.7 U
Total gravel	PSEP		**1.4**	**0.6**	**1.6**	**5.3**	**0.1**	0.1 U	**9.5**	**2.3**
Total sand	PSEP		**82.4**	**88.5**	**79.3**	**76.8**	**99**	**98.4**	**86**	**94**
Total silt	PSEP		**13.5**	**8.4**	**16.1**	**14.8**	1 U	1.5 U	**3.1**	3.7 U
Total clay	PSEP		**2.8**	**2.5**	**2.8**	**3**	1 U	1.5 U	**1.6**	3.7 U
Total fines (silt + clay)	PSEP		**16.3**	**10.9**	**18.9**	**17.8**	1 U	1.5 U	**4.7**	3.7 U
Metals (mg/kg)											
Arsenic	SW6020A	51	**3.7**	**2.1**	**9.3**	**10.2**	**1.7**	--	**2.9**	**2.6**
Cadmium	SW6020A	5.1	**0.045 J**	**0.0301 J**	**0.5**	**0.51**	**0.0312 J**	--	**0.0436 J**	**0.023 J**
Chromium	SW6020A	260	**10.9**	**9.9**	**34.3**	**35**	**10.4**	--	**8.8**	**8.9**
Copper	SW6020A	390	**13.5**	**10.5**	**39**	**41.5**	**9.8**	--	**12**	**10.4**
Lead	SW6020A	450	**2.68**	**1.78**	**345**	**323**	**14.9**	--	**3.61**	**1.32**
Mercury	SW7471A	0.41	**0.02**	**0.01**	**0.08**	**0.07**	**0.0061 J**	--	**0.00675 J**	**0.00472 J**
Silver	SW6020A	6.1	**0.058 J**	**0.036 J**	**0.6**	**0.6**	**0.05 J**	--	**0.06 J**	**0.029 J**
Zinc	SW6020A	410	**26**	**23**	**160**	**171**	**28**	--	**26**	**24**
PCB Aroclors (µg/kg)										
Aroclor 1016	SW8082A		3.9 U	3.9 U	3.8 U	76 U	3.9 U	4 U	3.8 U	3.9 U
Aroclor 1221	SW8082A		3.9 U	3.9 U	3.8 U	76 U	3.9 U	4 U	3.8 U	3.9 U
Aroclor 1232	SW8082A		3.9 U	3.9 U	3.8 U	76 U	3.9 U	4 U	3.8 U	3.9 U
Aroclor 1242	SW8082A		3.9 U	3.9 U	3.8 U	76 U	3.9 U	4 U	3.8 U	3.9 U
Aroclor 1248	SW8082A		3.9 U	3.9 U	**700**	570 U	58 U	4 U	**22**	3.9 U
Aroclor 1254	SW8082A		3.9 U	3.9 U	**1,600**	**2,200**	**150**	4 U	**25**	3.9 U
Aroclor 1260	SW8082A		3.9 U	3.9 U	**530**	**550**	**26**	4 U	**7.2**	3.9 U
Total PCB Aroclors (U = 0)	SW8082A	130	3.9 U	3.9 U	**2,830**	**2,750**	**176**	4 U	**54.2**	3.9 U
PCB Aroclors (mg/kg-OC)[a]										
Total PCB Aroclors (U = 0)	SW8082A	12	0.3 U	**NA**	**346.0**	**395.1**	**NA**	**NA**	**NA**	**NA**

Table 2
Z-layer Sediment Sample Results

			Sample ID	JF-PDS-7-0-1ft-160212	JF-PDS-7-1-2ft-160212	JF-PDS-7-2-3ft-160212
			Sample Date	2/12/2016	2/12/2016	2/12/2016
			Depth	0 to 1 foot	1 to 2 feet	2 to 3 feet
			Sample Type	N	N	N
Parameter	**Analytical Method**	**RvAL**				
Conventional Parameters (%)						
Total organic carbon	Plumb 1981			**0.05**	**0.047**	**0.034**
Total solids	SM2540G			**87.14**	**82.97**	**85**
Grain Size (%)						
Gravel	PSEP			**15.4**	**2.5**	**4.4**
Sand, very coarse	PSEP			**12.2**	**6.1**	**9.1**
Sand, coarse	PSEP			**28.2**	**39.2**	**41.2**
Sand, medium	PSEP			**29.8**	**43.5**	**34.4**
Sand, fine	PSEP			**8.8**	**5.7**	**5.7**
Sand, very fine	PSEP			**1.6**	**0.8**	**1.2**
Silt, coarse	PSEP			**0.7**	2.2 U	**1**
Silt, medium	PSEP			**0.4**	2.2 U	**0.4**
Silt, fine	PSEP			**0.6**	2.2 U	**0.5**
Silt, very fine	PSEP			**0.6**	2.2 U	**0.6**
Clay, coarse	PSEP			**0.4**	2.2 U	**0.4**
Clay, medium	PSEP			**0.4**	2.2 U	**0.3**
Clay, fine	PSEP			**0.9**	2.2 U	**0.8**
Total gravel	PSEP			**15.4**	**2.5**	**4.4**
Total sand	PSEP			**80.6**	**95.3**	**91.6**
Total silt	PSEP			**2.3**	2.2 U	**2.5**
Total clay	PSEP			**1.7**	2.2 U	**1.5**
Total fines (silt + clay)	PSEP			**4**	2.2 U	**4**
Metals (mg/kg)						
Arsenic	SW6020A	51		**1.8**	**1.7**	--
Cadmium	SW6020A	5.1		**0.15**	**0.0355 J**	--
Chromium	SW6020A	260		**10.5**	**9.2**	--
Copper	SW6020A	390		**12.7**	**9.1**	--
Lead	SW6020A	450		**5.98**	**1.37**	--
Mercury	SW7471A	0.41		**0.015**	**0.00452 J**	--
Silver	SW6020A	6.1		**0.057 J**	**0.03 J**	--
Zinc	SW6020A	410		**65**	**33**	--
PCB Aroclors (µg/kg)						
Aroclor 1016	SW8082A			77 U	3.9 U	3.8 U
Aroclor 1221	SW8082A			77 U	3.9 U	3.8 U
Aroclor 1232	SW8082A			77 U	3.9 U	3.8 U
Aroclor 1242	SW8082A			77 U	3.9 U	3.8 U
Aroclor 1248	SW8082A			**740**	**53**	**26**
Aroclor 1254	SW8082A			**1,200**	**49**	**8.8 J**
Aroclor 1260	SW8082A			**260**	**8.6**	3.8 U
Total PCB Aroclors (U = 0)	SW8082A	130		**2,200**	**110.6**	**34.8 J**
PCB Aroclors (mg/kg-OC)[a]						
Total PCB Aroclors (U = 0)	SW8082A	12		**NA**	**NA**	**NA**

Table 2
Z-layer Sediment Sample Results

Notes:
= exceedance of RvAL; mg/kg-OC relevant if TOC is between 0.5% and 4.0%, otherwise dry weight value is relevant
Bold = detected result
-- = not available
µg/kg = micrograms per kilogram
FD = field duplicate sample
J = estimated value
mg/kg = milligrams per kilogram
mg/kg-OC = milligrams per kilogram organic carbon normalized
NA = not applicable
N = normal environmental sample
PCB = polychlorinated biphenyl
PSEP = Puget Sound Estuary Program
RvAL = removal action level
U = compound analyzed, but not detected above detection limit
a. Organic carbon normalized results reported for samples with total organic carbon between 0.5% and 4%.

Table 3
Investigation Derived Waste Rinse Water and Sediment Drum Composite Results

	Sample ID Sample Date	JF-IDW-CQAP-W-160216[a] 2/16/2016	JF-IDW-CQAP-SE-160216[b] 2/16/2016
Parameter	**Analytical Method**		
Metals		**µg/L**	**mg/kg**
Arsenic	SW6020A	**3.9**	**2.1**
Cadmium	SW6020A	**0.2**	**0.101 J**
Chromium	SW6020A	**0.72**	**16.3**
Copper	SW6020A	**13.8**	**16.6**
Lead	SW6020A	**17.8**	**8.7**
Mercury	SW7471A	**0.030 J**	**0.0129 J**
Silver	SW6020A	**0.070 J**	**0.034 J**
Zinc	SW6020A	**61**	**46**
TCLP Metals		**mg/L**	**mg/L**
Arsenic	SW6010C	0.2 U	0.2 U
Cadmium	SW6010C	0.01 U	0.01 U
Chromium	SW6010C	0.02 U	0.02 U
Lead	SW6010C	0.1 U	0.1 U
Mercury	SW7470A	0.0001 U	0.0001 U
Silver	SW6010C	0.02 U	0.02 U
PCB Aroclors		**µg/L**	**µg/kg**
Aroclor 1016	SW8082A	0.01 U	3.9 U
Aroclor 1221	SW8082A	0.01 U	3.9 U
Aroclor 1232	SW8082A	0.01 U	3.9 U
Aroclor 1242	SW8082A	0.01 U	3.9 U
Aroclor 1248	SW8082A	**0.098**	**66**
Aroclor 1254	SW8082A	**0.15**	**160**
Aroclor 1260	SW8082A	**0.026 B**	**32**
Total PCB Aroclors (U = 0)		**0.274**	**258**

Notes:
Bold = detected result
µg/L = micrograms per liter
µg/kg = micrograms per kilogram
B = sample associated with method blank contamination
J = estimated value
mg/kg = milligrams per kilogram
mg/L = milligrams per liter
PCB = polychlorinated biphenyl
TCLP = toxicity characteristic leaching procedure
U = compound analyzed, but not detected above detection limit
a. Composite sample was collected from waste drums containing rinse water retained from field equipment decontamination.
b. Composite sample was collected from waste drums containing excess subsurface sediment retained during sampling.

Table 4
Field Equipment Blank Results

	Sample ID	JF-RB-160212
	Sample Date	2/12/2016
	Media	Sonic
	Sample Type	RB
	Matrix	WQ
Parameter	**Analytical Method**	
Metals (µg/L)		
Arsenic	SW6020A	**0.04 J**
Cadmium	SW6020A	0.1 U
Chromium	SW6020A	0.41 U
Copper	SW6020A	0.6 U
Lead	SW6020A	**0.1**
Mercury	SW7470A	0.1 U
Silver	SW6020A	0.2 U
Zinc	SW6020A	**6**
PCB Aroclors (µg/L)		
Aroclor 1016	SW8082A	0.01 U
Aroclor 1221	SW8082A	0.01 U
Aroclor 1232	SW8082A	0.01 U
Aroclor 1242	SW8082A	0.01 U
Aroclor 1248	SW8082A	**0.014**
Aroclor 1254	SW8082A	**0.033**
Aroclor 1260	SW8082A	**0.007 J**
Total PCB Aroclors (U = 0)	SW8082A	**0.054**

Notes:

Bold = detected result

µg/L = micrograms per liter

J = estimated value

PCB = polychlorinated biphenyl

RB = rinsate blank

U = compound analyzed, but not detected above detection limit

WQ = water quality control matrix

FIGURES

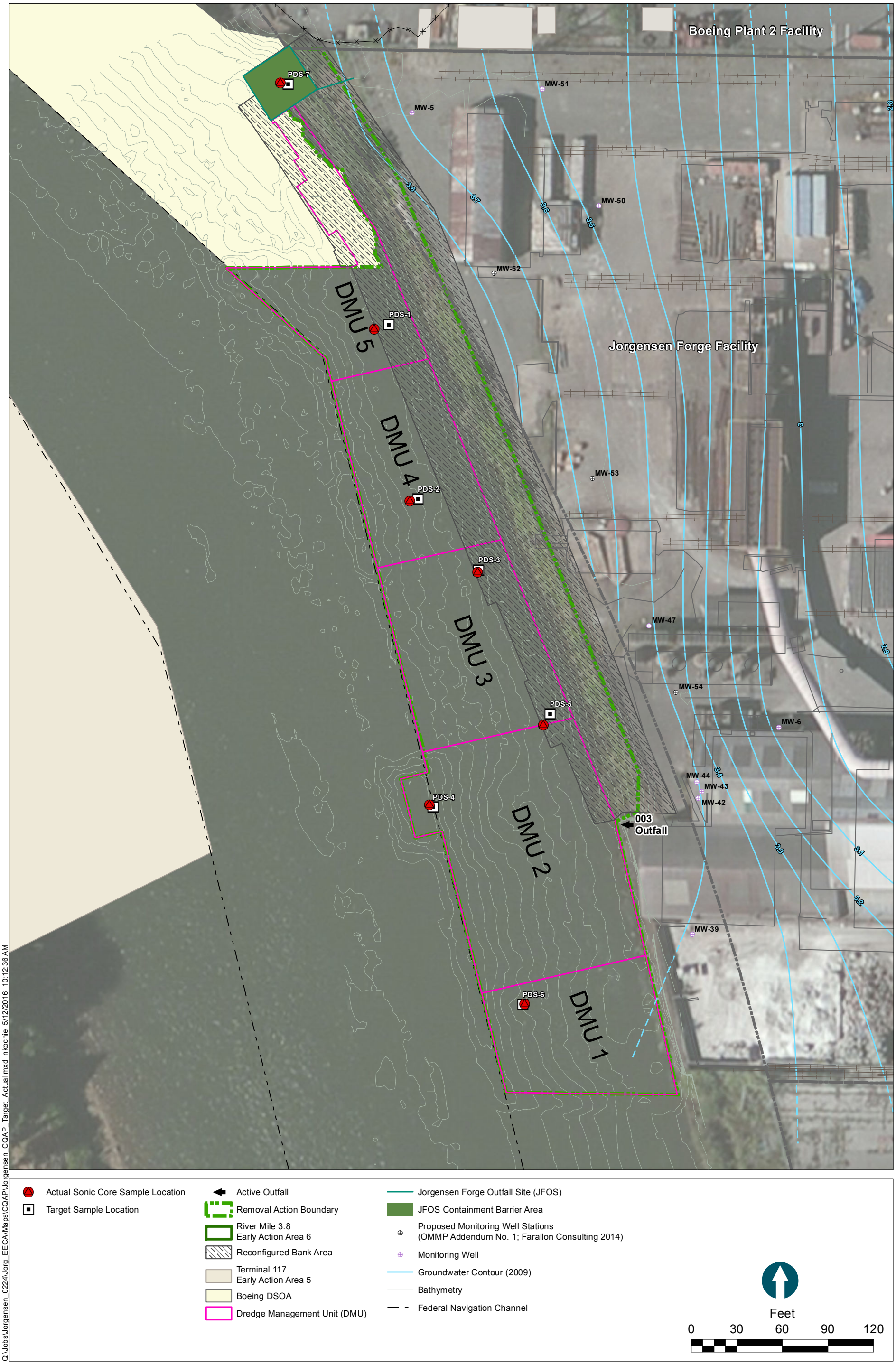

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Figure 1
Z-layer Sediment Sample Target and Actual Locations
Sediment Sampling Data Report
CQAP Modification No. 1 - Jorgensen Forge EAA

ANCHOR QEA

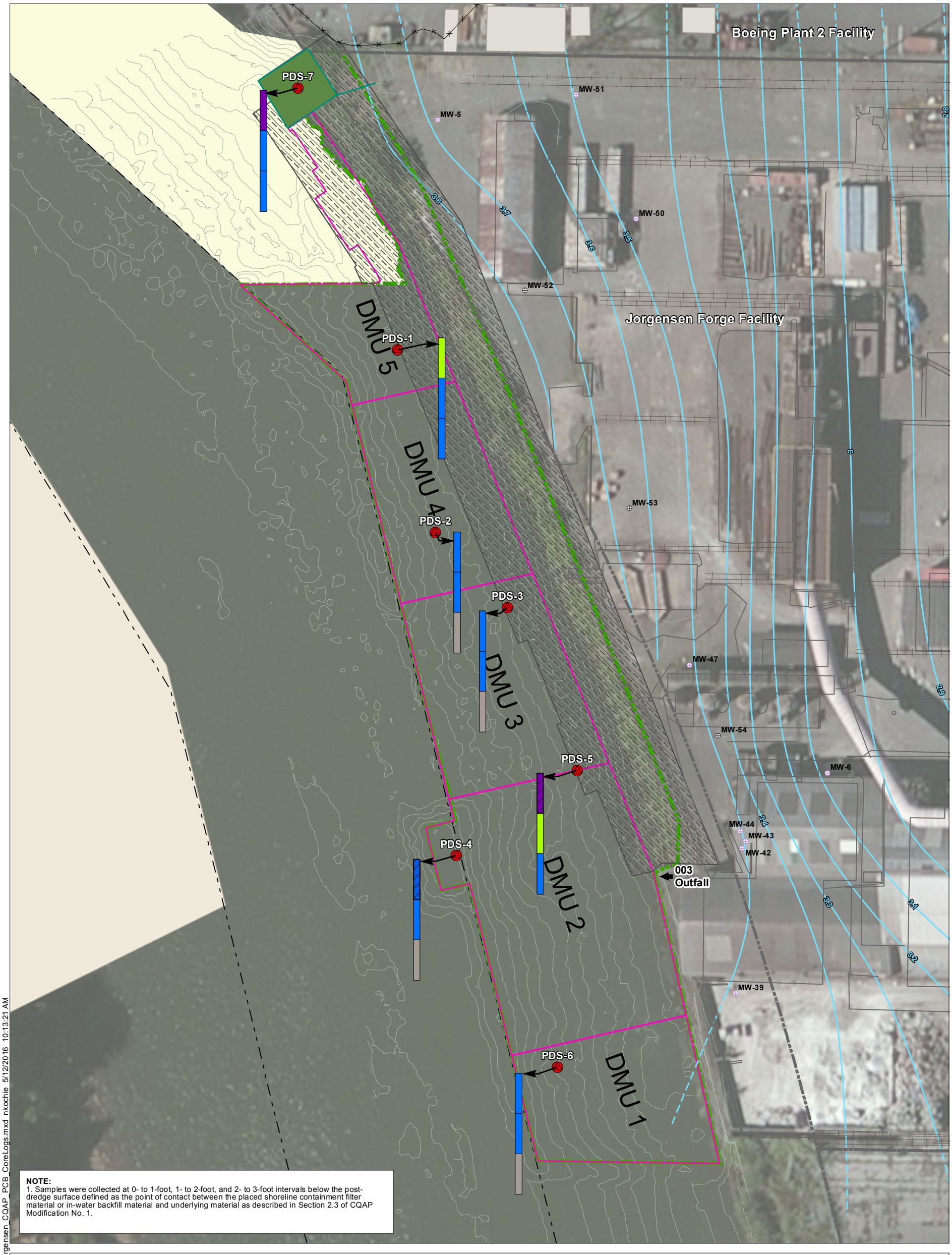

Figure 2
Z-layer Sediment Sample Results Compared to RvALs – Total PCBs
Sediment Sampling Data Report
CQAP Modification No. 1 - Jorgensen Forge EAA

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Figure 3
Z-layer Sediment Sample Results – Grain Size
Sediment Sampling Data Report
CQAP Modification No. 1 - Jorgensen Forge EAA

APPENDIX A
DATA VALIDATION REPORTS

APPENDIX B
LOGPLOT SONIC BORING LOGS

APPENDIX C
FIELD LOGS

APPENDIX D
PHOTOGRAPHS

APPENDIX E
LABORATORY REPORTS

APPENDIX F
CERTIFICATION FROM EPA THAT THE COLUMBIA RIDGE LANDFILL IS CERCLA COMPLIANT